

FRONT DOOR SOFTWARE REQUIREMENTS

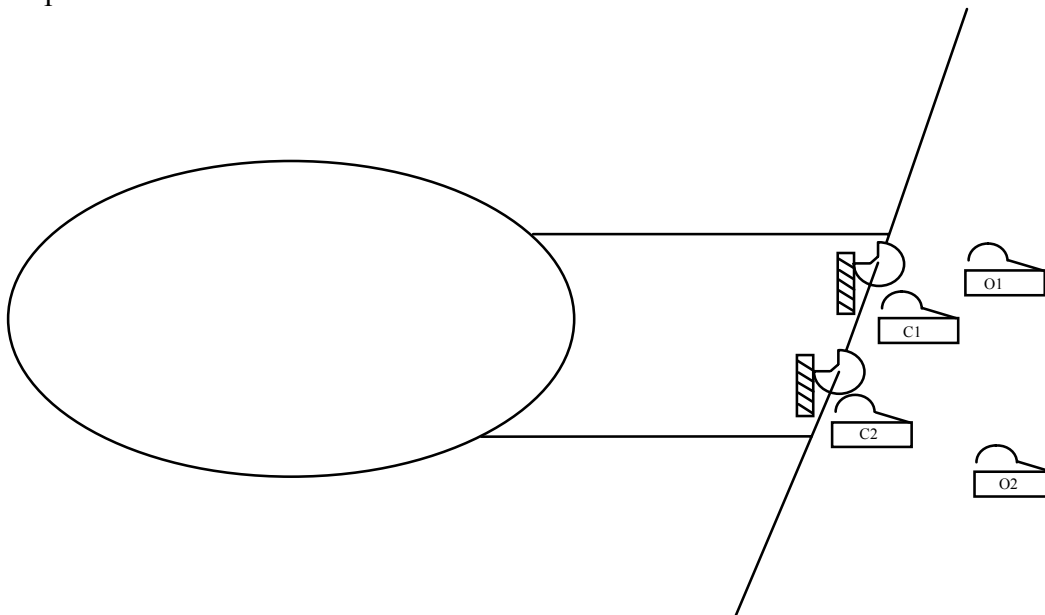
1. INTRODUCTION

This document contains the baseline DEP front door operational control requirements. It is based on a discussion among Michael Levay, Chris Edwards, and Dave Akin on 3 Aug. 1992. This document deals only with DEP requirements and contains no information about the Spacecraft monitored front door micro switches.

2. FRONT DOOR FUNCTIONAL DESCRIPTION

2.1. BLOCK DIAGRAM

The following is a block diagram of the MDI Front Door Mechanism Shown in the closed position.



2.1.1. SYSTEM DESCRIPTION

The system contains two motors each of which drives a worm gear. Each gear meshes with a circular gear that is mounted through bearings on a shaft. Near each bearing there is a small metal piece that is rigidly mounted on the shaft. A roll pin on each gear pushes against this metal piece as the gear turns. The rotation of the shaft opens the door. Either motor can open the door. The door can also be opened by running both motors at the same time. There are two micro switches, labeled O1 and O2 in the drawing that indicate the state of the door. A logical 1 on a door switch means that switch is in the open state, i.e. the door is not open. There are two micro switches labeled C1 and C2 in the drawing that indicate the state of the motor drives. A logical 0 on a motor switch means the switch is in closed position, i.e. the door is closed.

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2.1.2. OPERATION

When the DEP commands the door to the opened position, the commanded motor switches go to the not closed state, i.e. logical 1, within 50 milliseconds. The opening of the switches indicates that the door is no longer completely closed. Within 30 seconds of the DEP command to open the door, the door switches associated with the commanded motor closes, i.e. logical 0, indicating the door is completely open. This switch closure turns off the motor, so the second door switch may not close. The sequence of events is reversed for closing the door, i.e. shortly after the close command, the door switches indicate the door is not fully open and within 30 seconds the motor switches indicate the door is completely closed.

2.1.3. STATE TABLE

The following table describes the states of the 4 switches as a function of the states of the mechanism. Combinations not shown in the table are abnormal.

C1	C2	O1	O2	OPERATION/STATE
CLOSED (0)	CLOSED (0)	OPEN (1)	OPEN (1)	DOOR CLOSED
OPEN (1)	CLOSED (0)	OPEN (1)	X	DOOR MOVING BY MOTOR 1
CLOSED (0)	OPEN (1)	X	OPEN (1)	DOOR MOVING BY MOTOR 2
OPEN (1)	OPEN (1)	OPEN (1)	OPEN (1)	DOOR MOVING BY BOTH
OPEN (1)	CLOSED (0)	CLOSED (0)	X	DOOR OPENED BY MOTOR 1
CLOSED (0)	OPEN (1)	X	CLOSED (0)	DOOR OPENED BY MOTOR 2
OPEN (1)	OPEN (1)	CLOSED (0)	CLOSED (0)	DOOR OPENED BY BOTH

X indicates undetermined states, i.e. could be either 1 or 0.

3. FAILURE MODES

The commanded door motor(s) are switched off automatically by the electronics when the appropriate micro switches close. For example, when opening by motor 1, motor 1 operates until the O1 micro switch indicates the door is open. If a micro switch should fail on either an opening or a closing operation, the effected motor will continue to operate. On an opening operation, this can lead to damage to the gears. On a closing operation, this can cause the worm gear to permanently disengage from the gear on the shaft, rendering that motor no longer useful.

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4. DEP PROCESSING REQUIREMENTS

The following list defines the DEP software requirements associated with the operation of the front door mechanism:

- The DEP shall supply sufficient housekeeping telemetry to ascertain the state of the door mechanism and its associated electronics (see paragraph 5).
- The DEP shall supply command capability to allow ground control of all normal door functions (see paragraph 6).
- The DEP shall monitor each door mechanical operation (open or close). If the door electronics does not indicate a done status after 30 seconds, a reset shall be sent to the effected motor(s).
- Telemetry shall include the time required for the most recent door operation up to 30 seconds to a resolution of 1/16 second, a code to identify the operation, and the status of the operation. The status shall include normal, time out, and in progress. The status will be reset by the next command that moves the door.
- There will be no command to change the time out value. If the time out must be changed, it will be done by a memory load command.

5. TELEMETRY

The following table defines the housekeeping telemetry associated with the normal operation of the door. The Spacecraft monitored bi-levels associated with the door are not shown.

MNEMONIC	TYPE	DESCRIPTION
MKPWFD	D (1)	Door Power (K3-4)
MKFDOPN1	D (1)	Door Open Status 1
MKFDOPN2	D (1)	Door Open Status 2
MKFDMTR1	D (1)	Door Motor 1 Status
MKFDMTR2	D (1)	Door Motor 2 Status
MKFDTIME	R (10)	Door Move Time
MKFDFUNC	D (3)	Door Function
MKFDSTAT	D (1)	Door Operation Status
MKFDMOVE	D (1)	Door Moving Indicator

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6. COMMANDS

The following table defines the DEP commands associated with the normal operation of the front door.

MNEMONIC	DESCRIPTION
MBPWFDON	Front Door "ON"
MBPWFD0F	Front Door "OFF"
MBFDNOP	Front Door No Operation
MBFD1O	Front Door Open with Motor 1
MBFD2O	Front Door Open with Motor 2
MBFD1C	Front Door Close with Motor 1
MBFD2C	Front Door Close with Motor 2
MBFDBO	Front Door Open with Both
MBFDBC	Front Door Close with Both
MBFDRS	Reset Front Door